Comparison Between Geriatric and Non-geriatric Patients in the Development of Complications After Percutaneous Endoscopic Gastrostomy

Cem Azılı1, Harun Karabacak2, Şener Balas2, Muhammed Apaydın2, Selim Tamam1, Serdar Çulcu1, Ahmet Oğuz Hasdemir2

1Ankara University Faculty of Medicine, Department of General Surgery, Division of Surgical Oncology, Ankara, Turkey
2Ankara Etlik City Hospital, Clinic of General Surgery, Ankara, Turkey

Abstract

Objective: Despite the rising geriatric age and the need for percutaneous endoscopic gastrostomy, there are few data regarding its complications and mortality rates in geriatric patients.

Materials and Methods: This is a retrospective study of patients over 18 years old who had a percutaneous endoscopic gastrostomy tube inserted between January 2016 and December 2020. Age, gender, percutaneous endoscopic gastrostomy indications, minor and major post-procedure complications, and 30-day mortality rates were compared between geriatric and non-geriatric patients.

Results: Females accounted for 276 (47.6%) of the 580 patients, while 304 (52.4%) were males. Among the study population, 65.7% of the patients were older patients (n=381), and the median age was 67.8 years. Alzheimer’s dementia accompanying dysphagia (n=232; 40%) and stroke (n=148; 25%) were the most prevalent diagnoses. No differences were found regarding the complication rate between geriatric patients and non-geriatric patients. The incidence of complications after percutaneous endoscopic gastrostomy insertion was 35.8%, with 71.1% are minor. Granuloma (12.6%) was the most minor complication while buried bumper syndrome (4.8%) was the most common major complication. However, peristomal leakage-necrotizing fasciitis and aspiration pneumonia was the most lethal complications. The mortality rate was 0.5%, and there was no significant difference between geriatric patients and non-geriatric patients.

Conclusion: We established that older age alone was not a risk factor for geriatric patients undergoing percutaneous endoscopic gastrostomy because there was no statistically significant difference between the complication and mortality rates of younger and older individuals. Hence, PEG can be used safely on older patients when necessary.

Keywords: Alzheimer’s disease, geriatric care management, geriatrics, percutaneous endoscopic gastrostomy

Introduction

The term older person is generally defined as someone aged 65 years or older, whereas the term geriatric patient often implies a high degree of frailty and associated pathologies rather than age. Geriatric patients cannot be described by age alone but will be associated with the typical morbidity observed in older patients. Nutritional disorders are becoming an increasingly serious problem in geriatrics as a result of impaired oral intake and comorbidities (1). Enteral nutrition has many advantages over parenteral nutrition in patients who require nutritional support, including lower costs, reduced bacterial translocation, and a lower risk of sepsis. As a result, enteral nutrition is the preferred method when the gastrointestinal tract is functional. Enteral nutrition is possible with a gastrostomy tube, which can be placed surgically or radiologically in patients whose oral intake is insufficient. Percutaneous endoscopic gastrostomy (PEG) is recommended for patients with normal gastrointestinal
system function who will not be fed orally for more than three
weeks (2,3).

PEG, which was initially designed for children, is now used in all
age groups for various indications (4). Head and neck traumas,
various chronic neurological diseases such as Parkinson’s
disease and dementia, and upper esophageal and pharyngeal
cancers are the most common indications (5,6). Weight loss and
malnutrition can be avoided with PEG, but complications such as
PEG site infection, aspiration pneumonia, gastric perforation,
and necrotizing fasciitis may occur after the procedure (7,8).

The elevated incidence of concomitant diseases in older patients
requiring PEG, such as cerebrovascular accidents, malignancy,
and neurodegenerative disorders, may be a risk factor for the
development of complications (9). In this study, we aimed
to assess the safety of PEG insertion in geriatric patients by
comparing them with non-geriatric patients and to evaluate
procedure-related complications. To the best of our knowledge,
no study has compared the complication rate due to PEG
insertion between the geriatric and non-geriatric populations.

Materials and Methods

This is a retrospective study that included PEG insertions
in patients over the age of 18 years performed by a single
surgeon between January 2016 and December 2020. The Ethics
Committee of clinical research at University of Health Sciences
Turkey, Dışkapı Yıldırım Beyazıt Training and Research Hospital
granted ethical approval (date: 12.09.2022, no: 146/04). The
study excluded patients younger than 18 years of age and
117 cases in which the PEG tube was being replaced. The
term “geriatric” patient was used for older people above 65
years and generally having additional comorbidities. We used
the “pull” method for inserting the PEG tubes introduced by
Gauderer et al. (4). After being given verbal information about
PEG insertion, patients or their representatives were routinely
asked to provide written consent. The patients’ oral intake was
stopped at least eight hours before the procedure. Intravenous
midazolam was administered to all patients for sedation
during the procedure. Oxygen saturation, pulse rate, and blood
pressure were monitored during PEG insertion. Patients who
were taking antiaggregant drugs had been instructed to stop
taking them five days before the intervention. Antiaggregant
medications were reinstated 1-2 days after the procedure. A
note was recorded for patients who received a single dose of
intravenous cefazolin as antimicrobial prophylaxis (AMP) prior
to PEG insertion. Considering the patient’s clinical status and
the existence of comorbidities, the decision to administer AMP
was made. All inpatients with coexisting diseases received AMP.
Lidocaine hydrochloride spray and prilocaine were used for local
oropharyngeal and skin incision anesthesia. Povidone-iodine
was used to provide skin antisepsis. All PEG insertions were
performed by a single experienced general surgeon. The PEG
tube was used to initiate progressive advancement of enteral
feedings beginning 24 hours after the procedure.

Complications that occurred within the first 30 days after
PEG insertion was evaluated and classified as minor or major
complications. Minor complications included granuloma,
PEG tube obstruction, local wound infections, and PEG tube
dislodgement. Major complications included buried bumper
syndrome, aspiration pneumonia, peristomal leakage, gastric
bleeding, gastrocolic fistula, intestinal injury, and necrotizing
fasciitis. Age, gender, indications for PEG insertion, post
procedure complications, and 30-day mortality rates were
analyzed.

Statistics

For quantitative variables, mean, standard deviation, and
median (minimum-maximum) were used as descriptors, and for
qualitative variables, the number of patients (percentage) was
used. For categorical variables, numbers and percentages were
used. The Kolmogorov-Smirnov test was used to examine
the normal distribution of numerical variables. The Mann-Whitney
U test or Student’s t-test were used to compare two independent
groups. The chi-square test was used to compare differences
between categorical variables. The Statistical Package for the
Social Sciences (SPSS) for Windows version 22.0 was used
for all analyses. A p-value of 0.05 was considered statistically
significant.

Results

Five hundred and eighty patients had PEG insertions between
January 2016 and December 2020. There were 276 female
patients (47.6%) and 304 male patients (52.4%). The cohort
was divided into geriatric and non-geriatric patients. The
geriatric age group included 381 patients (65.7%). The
average age of patients who did not have complications
was 68.9 years (Table 2). A total of 372 (64.2%) patients had no
complications after PEG insertion, while 208 had complications,

The complication rate did not differ by age (p=0.87). The average
age of patients who had complications was 65.9 years while
the average age of patients who did not have complications
was 68.9 years (Table 2). A total of 372 (64.2%) patients had no
complications after PEG insertion, while 208 had complications,
Table 1. The demographic characteristics, complication and mortality rate and, the mean age distribution for the various indications for PEG insertion

<table>
<thead>
<tr>
<th>Number of participants</th>
<th>Geriatric patients</th>
<th>381 (65.7%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-geriatric patients</td>
<td>199 (34.3%)</td>
</tr>
<tr>
<td>Sex</td>
<td>Female</td>
<td>276 (47.6%)</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>304 (52.4%)</td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>67.8±19.1</td>
<td></td>
</tr>
</tbody>
</table>

Average age based on indications for PEG insertion (years)

<table>
<thead>
<tr>
<th>Complications</th>
<th>Number, %</th>
<th>Mean age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alzheimer's dementia</td>
<td>232 (40%)</td>
<td>83.1±6.8</td>
</tr>
<tr>
<td>Cerebrovascular accidents</td>
<td>148 (25.5%)</td>
<td>68.3±8.1</td>
</tr>
<tr>
<td>Head trauma</td>
<td>74 (12.8%)</td>
<td>35.5±11.1</td>
</tr>
<tr>
<td>Parkinson's disease</td>
<td>52 (9%)</td>
<td>70.1±8.2</td>
</tr>
<tr>
<td>Cerebral hemorrhage</td>
<td>22 (3.7%)</td>
<td>59.9±9.6</td>
</tr>
<tr>
<td>Cancer</td>
<td>16 (2.8%)</td>
<td>50.6±5.8</td>
</tr>
<tr>
<td>Cerebral palsy</td>
<td>14 (2.4%)</td>
<td>24.2±18.1</td>
</tr>
<tr>
<td>Sepsis</td>
<td>12 (2.1%)</td>
<td>62.3±9.7</td>
</tr>
<tr>
<td>ALS</td>
<td>10 (1.7%)</td>
<td>47.3±9.5</td>
</tr>
</tbody>
</table>

Complications

| None                          | 372 (64.2%) |
| Present                       | 208 (35.8%) |
| Minor                         | 148 (25.5%) |

<table>
<thead>
<tr>
<th>Minor Complications</th>
<th>Number, %</th>
<th>Mean age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Granuloma</td>
<td>73 (12.6%)</td>
<td></td>
</tr>
<tr>
<td>Obstruction of PEG tube</td>
<td>46 (7.9%)</td>
<td></td>
</tr>
<tr>
<td>Local wound infections</td>
<td>28 (4.8%)</td>
<td></td>
</tr>
<tr>
<td>Dislodgement of PEG tube</td>
<td>1 (0.2%)</td>
<td></td>
</tr>
</tbody>
</table>

Major

Buried bumper syndrome        | 28 (4.8%)              |                  |
Aspiration pneumonia          | 13 (2.2%)              |                  |
Peristomal leakage            | 10 (1.8%)              |                  |
Gastric bleeding              | 6 (1%)                 |                  |
Gastrocolic fistula           | 2 (0.3%)               |                  |
Intestinal injury             | 1 (0.2%)               |                  |

Mortality rate

<table>
<thead>
<tr>
<th>Mortality rate</th>
<th>Number, %</th>
<th>Mean age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>3 (0.5%)</td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>1 (0.2%)</td>
<td></td>
</tr>
</tbody>
</table>

Etiologies

Aspiration pneumonia          | 1 (0.2%)              |                  |

PEG: Percutaneous endoscopic gastrostomy, ALS: Amyotrophic lateral sclerosis

Table 2. Comparison of complication rates after PEG insertion based on age distributions

<table>
<thead>
<tr>
<th>Complications</th>
<th>Number</th>
<th>Mean age (years)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>372</td>
<td>68.9±18.3</td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>208</td>
<td>65.9±20.4</td>
<td>0.87</td>
</tr>
<tr>
<td>Total</td>
<td>580</td>
<td>67.8±19.1</td>
<td></td>
</tr>
</tbody>
</table>

Mann-Whitney U test, PEG: Percutaneous endoscopic gastrostomy
indicating a complication rate of 35.8%. Fortunately, 71.1% (148/208) of all complications were classified as minor (n=148, 25.5%). Granulomas (12.6%), PEG obstructions (7.9%), and local wound tube infections (4.8%) were the most common minor complications. Major complications were observed in 60 patients (10.3%) including buried bumper syndrome (4.8%), aspiration pneumonia (2.2%), and peristomal leakage (1.8%). The complication rates in patients with amyotrophic lateral sclerosis (ALS), cerebral palsy, and brain tumors were significantly higher (p=0.001), whereas there were no complications in patients with laryngeal cancers. Table 3 shows the relationship between complication rates and PEG indications. AMP was administered to 264 patients (45.5%), primarily inpatients. The complication rate did not differ significantly with the AMP administration (p=0.063).

Table 4 compares geriatric versus non-geriatric PEG patients in terms of complications, and mortality. The mortality rate related to PEG was 0.5% (3/580) and was similar between groups. Necrotizing fasciitis caused by peristomal leakage (n=2; one geriatric patient and one non-geriatric patient) and aspiration pneumonia (n=1; one geriatric patient) were the causes of PEG related mortality.

Discussion

Due to the prevalence of comorbidities and inadequate dietary intake, malnutrition is a common concern among the older people (10,11). PEG can improve the quality of life by providing nutritional support (12). Our research on the complication rates of PEG in geriatric patients indicates that the procedure is safe. The incidence of procedure-related complications was found to be comparable between the geriatric and non-geriatric patient populations. Moreover, there were no statistically significant differences in mortality rates based on age. We believe that age is not a risk factor alone in geriatric patients with PEG insertion. It should be remembered that Alzheimer's disease may be the only pathologic issue in a substantial fraction of geriatric patients, despite their older age and the presence of critical comorbidities.

Although Alzheimer's dementia is the most common reason for PEG insertion among the geriatric population, accompanying dysphagia and stroke have become more prevalent indications in recent years (11,13). Cerebrovascular accidents and head trauma are also common causes of PEG insertion (3,14). The pathology that necessitates the use of a PEG tube varies with age. We found that the demand for PEG grows dramatically at younger ages in illnesses such as cerebrovascular accidents, head trauma,

Table 3. The distribution of complications based on the indications for PEG insertion and the relationship between complication development and the AMP

<table>
<thead>
<tr>
<th>Distribution of complications based on indications</th>
<th>No complication</th>
<th>Complication present</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alzheimer's dementia</td>
<td>161 (69.4%)</td>
<td>71 (30.6%)</td>
<td></td>
</tr>
<tr>
<td>Cerebrovascular accidents</td>
<td>86 (58.1%)</td>
<td>62 (41.9%)</td>
<td></td>
</tr>
<tr>
<td>Head trauma</td>
<td>49 (66.2%)</td>
<td>25 (33.8%)</td>
<td></td>
</tr>
<tr>
<td>Parkinson's disease</td>
<td>34 (65.4%)</td>
<td>18 (34.6%)</td>
<td></td>
</tr>
<tr>
<td>Cerebral hemorrhage</td>
<td>10 (45.5%)</td>
<td>12 (54.5%)</td>
<td></td>
</tr>
<tr>
<td>Laryngeal cancer</td>
<td>11 (100%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Cerebral palsy</td>
<td>6 (42.9%)</td>
<td>8 (57.1%)</td>
<td></td>
</tr>
<tr>
<td>Sepsis</td>
<td>11 (91.7%)</td>
<td>1 (8.3%)</td>
<td></td>
</tr>
<tr>
<td>ALS</td>
<td>3 (30%)</td>
<td>7 (70%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>372 (64.2%)</td>
<td>208 (35.8%)</td>
<td></td>
</tr>
</tbody>
</table>

AMP: 0.001

AMP: 0.063

PEG: Percutaneous endoscopic gastrostomy, AMP: Antimicrobial prophylaxis, ALS: Amyotrophic lateral sclerosis

Table 4. Comparison between geriatric and non-geriatric PEG in terms of complications, and mortality

<table>
<thead>
<tr>
<th>Presence of complications</th>
<th>Non-geriatrics (n=199 (34.3%))</th>
<th>Geriatrics (n=381 (65.7%))</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>120 (62.7%)</td>
<td>252 (67.7%)</td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>79 (38%)</td>
<td>129 (62.0%)</td>
<td></td>
</tr>
</tbody>
</table>

Complications type: 0.29

<table>
<thead>
<tr>
<th>Mortality rate</th>
<th>Non-geriatrics (n=199 (34.3%))</th>
<th>Geriatrics (n=381 (65.7%))</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>1 (0.5%)</td>
<td>1 (0.3%)</td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td>1 (0.5%)</td>
<td>1 (0.3%)</td>
<td></td>
</tr>
</tbody>
</table>

PEG: Percutaneous endoscopic gastrostomy
ALS, and cerebral palsy, while Alzheimer’s dementia was the most common reason for PEG in geriatric patients.

PEG tube insertion has been considered a relatively safe and effective intervention. However, studies have found that the mortality and complication rates associated with PEG insertion were significantly higher than predicted (15). According to a recent report, 18–38% of PEG patients experienced moderate complications and 2–4% of PEG insertions led to life-threatening complications. Complications can be divided into two categories based on their severity: minor and major complications. The overwhelming majority of complications, such as wound infections and minor bleeding, are considered minor complications. Necrotizing fasciitis and colocutaneous fistulas are rare complications (16). According to some studies, the incidence of complications after the PEG insertion may range from 16% to 70% (17-21). Variations in the rates reported in the scientific literature due to be caused by differences in the patient populations examined. Older people with a history of infection or aspiration pneumonia are more likely to develop complications (6,20). Our frequency and distribution of minor and major complications were comparable to those of other studies. Our rate of complications was 35.8%, of which 71.1% were evaluated as minor. Granulomas, blockage of the PEG tube, and local wound infections were the most frequently occurring minor complications. There was no significant difference in the development of complications between the geriatric and nongeriatric populations. A multicenter study on PEG mortality and complications determined that older patients had a greater risk of major complications, but the geriatric population was not specifically evaluated (16). Despite the fact that comorbidity is more common in the older people, a recent retrospective study found no significant difference in general complication rates between older and young patients, which is consistent with our findings. We agree with Wirth et al. (22) that procedure-related complications are more dangerous risk factors than old age itself.

A study on AMP in PEG patients supports the use of systemic antibiotics and demonstrates that AMP is effective against peristomal infections in PEG insertion. Various antibiotics, including ceftriaxone, cefuroxime, cefazolin, and cefoxitin, have been evaluated in randomized studies evaluating AMP in PEG patients (23,24). In our study, there was no significant relationship between the complication rate and AMP administration. Recent reports also stated that no differences were found regarding major complications and mortality rates in patients who had given AMP prior to PEG insertion (25).

A recent meta-analysis revealed that despite the fact that PEG-fed patients had a significantly better quality of life than nasogastric-fed patients, there was no significant difference in mortality rates between the two groups. Mortality risk exists regardless of whether a PEG tube is inserted in older or young patients (26). Although complications associated with PEG insertion are believed to be rare, the 30-day mortality rate ranges from 3% to 23%, and the overall hospital mortality rate was reported to be 5% (11,16,26). The fact that our 30-day mortality rate was 0.5%, which is comparable to the lower level of mortality rates reported in the medical literature, is encouraging.

Although necrotizing fasciitis is a rare complication of PEG, severe traction of the PEG tube may increase the risk in patients with comorbid conditions (8,16). Numerous microorganisms contribute to the life-threatening complication of necrotizing fasciitis; effective treatment options include extensive surgical debridement and broad-spectrum antibiotic therapy. The leading cause of death in our studies was necrotizing fasciitis caused by peristomal leakage. It is known that the condition is more prevalent in diabetic patients and those taking corticosteroids or other immunosuppressive drugs. As evidenced by our data, we believe that this life-threatening complication may result from complications encountered during or after the PEG procedure and not from advanced age.

**Study Limitations**

The most significant limitations of this study are that it is retrospective and unicentric. In addition, we were unable to evaluate all the requested data due to a deficiency of information in the medical records. Prospective studies from multiple institutions are necessary to confirm our findings. However, because some patients are referred daily from aged care homes in numerous institutions, it is difficult to collect prospective data due to the inability to follow up after the procedure. The data which may be directly related to the nutrition status such as albumin, and hemoglobin could be included to discuss the presence of nutritional disorders. But, it was not possible to obtain these data in all patients due to the retrospective nature of the study. Given the paucity of data in the literature on PEG complications in elderly patients and the fact that 580 PEG procedures were performed in our study by a single experienced surgeon, we deem this study to be valuable research.

**Conclusion**

The PEG procedure is feasible and safe for older patients. However, geriatric patients require careful patient selection. PEG insertion may be complicated by comorbidities and surgical complications related to the patient but we believe that age is not a risk factor alone in geriatric patients for PEG insertion. Prospective research is required to resolve the discrepancies in the literature regarding PEG outcomes in the geriatric population.
Ethics

Ethics Committee Approval: The Ethics Committee of clinical research at University of Health Sciences Turkey, Dişkapı Yıldırım Beyazıt Training and Research Hospital granted ethical approval (date: 12.09.2022, no: 146/04).

Informed Consent: After being given verbal information about PEG insertion, patients or their representatives were routinely asked to provide written consent.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References